



**Heritage Brodiaea Preserve
2021 Summary Monitoring Report (Year 5)
San Diego, California**

Prepared for
Lennar Homes
16465 Via Esprillo, Suite 150
San Diego, CA 92127

Prepared by
RECON Environmental, Inc.
3111 Camino del Rio North, Suite 600
San Diego, CA 92108
P 619.308.9333

RECON Number 7108-3
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A handwritten signature in black ink that reads "Gerry Scheid".

Gerry Scheid, Senior Biologist

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1.0 Introduction

This monitoring report presents the results of activities conducted within the Heritage Brodiaea Preserve (HBP) during the time period of January 1 to December 31, 2021. Activities discussed in this report include site maintenance activities, thread-leaved brodiaea (*Brodiaea filifolia*) 2021 population (vegetative) counts and flowering data, and native grassland mitigation implementation.

The HBP is an approximately 14-acre biological open space area that was dedicated as part of the Heritage Bluffs II development project. The HBP is located in the northern part of San Diego County (Figure 1) and it occurs to the south of Carmel Valley Road and to the east of the Black Mountain Open Space Preserve (Figure 2). The City of San Diego has now included the HBP area into its Multiple Species Conservation Program Subarea Plan's Multi-Habitat Planning Area.

The goal of the HBP is to facilitate the conservation, preservation, and enhancement of biological resources as part of mitigation for impacts associated with development of the Heritage Bluffs II and East Clusters development project sites. The HBP has preserved a regionally significant population of thread-leaved brodiaea in a Conservation Easement (CE) dedicated for that purpose.

2.0 HBP Translocation History

The translocation of salvaged thread-leaved brodiaea occurred as part of the East Clusters Unit 3 and Heritage Bluffs II development projects and the locations of these translocations are shown on Figure 3. These translocation efforts established the baseline numbers of thread-leaved brodiaea plants for the mitigation monitoring effort. The 2021 monitoring year represents the fifth year after translocation for the Heritage Bluffs II thread-leaved brodiaea and the sixth year after translocation for the East Clusters Unit 3 effort.

3.0 HBP 2021 Maintenance Activities

Maintenance activities conducted within the preserve area during 2021 focused on the control of perennial weeds and non-native grasses. General control of perennial weeds occurred in February, March, April, May, and June. During the fall months, hand weeding was conducted around thread-leaved brodiaea locations to remove excess grasses.

4.0 HBP 2021 Thread-leaved Brodiaea Vegetative Counts

A census of the number of thread-leaved brodiaea expressing vegetative growth in the HBP was conducted during the months of January through March of 2021. The census involved the relocation of natural thread-leaved brodiaea plants previously found in the HBP, the mapping of expressed natural thread-leaved brodiaea plants not previously located, and all translocated thread-leaved brodiaea plant locations (i.e., corm and cut/block) now within the HBP.

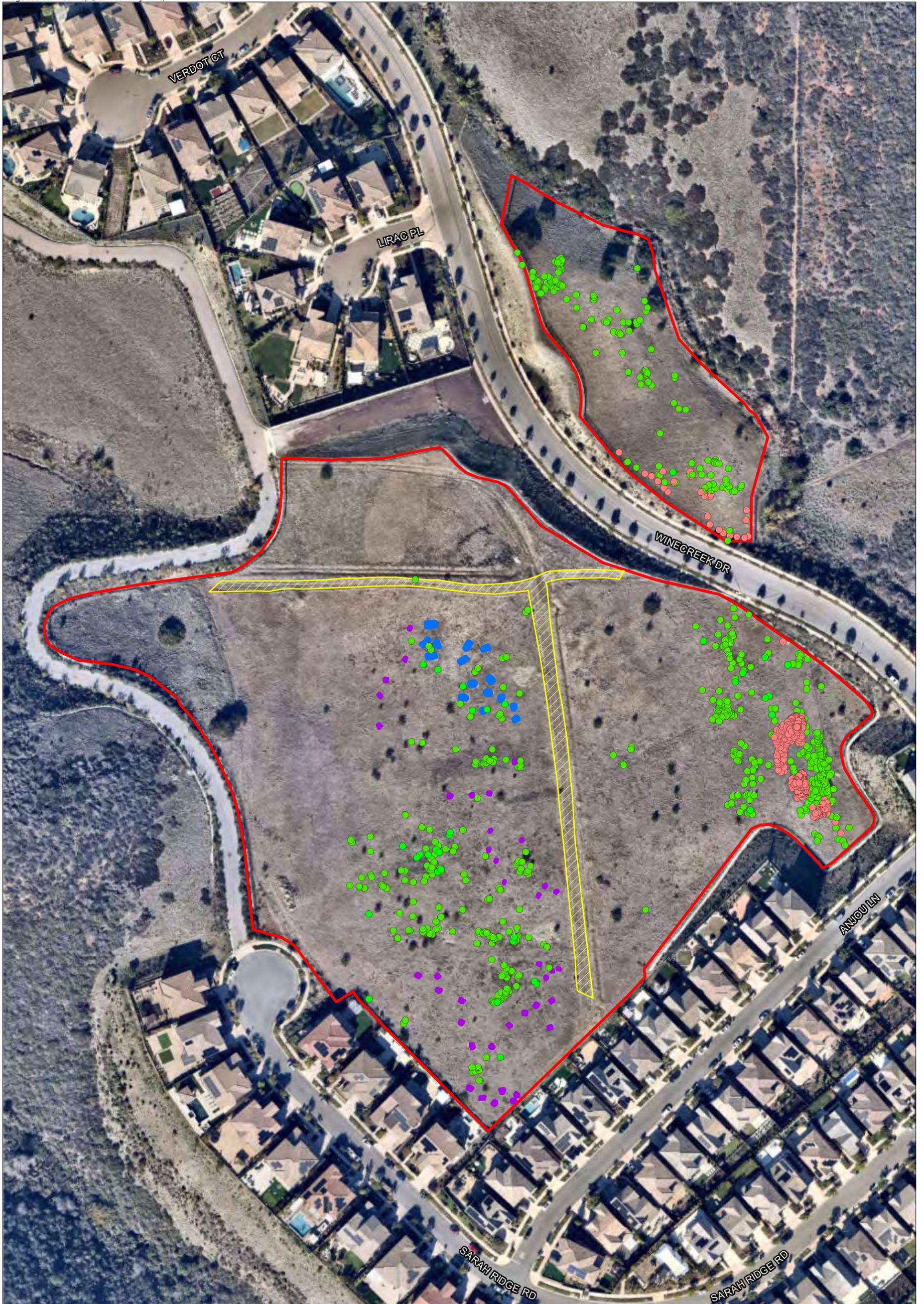


 Project Location



 HBP Boundary

FIGURE 2
HBP Location on Aerial Photograph



- HBP Boundary
- East Clusters Unit 3 Transplant
- Heritage Bluffs II Corm Transplant
- Native Grassland Mitigation Area
- Natural Brodiaea
- Heritage Bluffs II Cut/Block Transplant



FIGURE 3
Distribution of Natural and Translocated
Thread-leaved Brodiaea in the HBP

Each thread-leaved brodiaea location, both natural and translocated, was visited and a direct count of the vegetative individuals expressed at the location was done. The 2021 vegetative count data are given in Table 1 (HBP natural population), Table 2 (Heritage Bluffs II translocated), and Table 3 (East Clusters Unit 3 translocated and transplanted) along with vegetated count data from previous years and the baseline reference counts.

Table 1 HBP Thread-leaved Brodiaea Vegetative Counts for Natural Population					
	2017 Vegetative Count*	2018 Vegetative Count*	2019 Vegetative Count*	2010 Vegetative Count*	2021 Vegetative Count*
TOTAL	10,211	15,263	13,811	13,848	13,161
*Based on count of individuals that expressed vegetatively.					

Table 2 Heritage Bluffs II Thread-leaved Brodiaea Translocation Summary: 2017 through 2021						
Translocation Method	Initial Translocation Estimate	2017 Vegetative Count*	2018 Vegetative Count*	2019 Vegetative Count*	2020 Vegetative Count*	2021 Vegetative Count*
Corm Translocation	2,690	2,556	2,727	3,192	3,840	4,859
Corm Translocation†	1,166	1,161	1,262	1,389	1,413	1,774
Cut-Block Salvage‡	1,850	2,414	2,477	3,816	3,789	3,496
TOTAL	5,706**	6,131	6,556	8,397	9,013	10,129
*Based on count of individuals that expressed vegetatively.						
†Salvaged from East Clusters.						
‡Salvaged and planted March 2017.						
**Total planted individuals to be used as baseline for subsequent site assessments.						

Table 3 East Clusters Unit 3 Thread-leaved Brodiaea Translocation Summary: 2017 through 2021						
Translocation Method	2016 Vegetative Count*	2017 Vegetative Count*	2018 Vegetative Count*	2019 Vegetative Count*	2020 Vegetative Count*	2021 Vegetative Count*
Corm Translocation	3,175	3,281	3,569	5,311	5,306	7,358
TOTAL	3,175	3,281	3,569	5,311	5,306	7,358
*Based on count of individuals that expressed vegetatively.						

There was an increase in herbivory to the natural thread-leaved brodiaea locations during 2021. The primary cause of herbivory was from animals digging up the corms (Photographs 1 and 2). The digging up of underground plant parts appears to be more common during dry years as herbivores look for supplemental food sources as the aboveground vegetative forage dries earlier and there is less of it. Herbivores also grazed on the vegetative portion of the thread-leaved brodiaea plants (Photographs 3 and 4).

Precipitation amounts for this portion of San Diego County were below normal during the 2020–2021 rainfall season. Despite the low precipitation amounts, the vegetative growth of the thread-leaved brodiaea population within the HBP remained stable compared to the previous year counts based on the results of the vegetative counts for the spring of 2020. Representative photographs of vegetative growth observed during the 2021 counts are provided (Photographs 5–12).

5.0 HBP 2021 Thread-leaved Brodiaea Flowering Individuals Count

A count of the number of thread-leaved brodiaea individuals that produced a flower stalk during the spring of 2021 was conducted within the HBP. The flower stalk count included all the translocated locations and a sampling of a number of naturally occurring thread-leaved brodiaea locations (58 total). The data on flowering individuals are given in Table 4. Representative photographs of thread-leaved brodiaea individuals in flower are shown in Photographs 13 and 14.

Brodiaea Type	Flowering Individuals	Percent Vegetative Individuals Flowering
Heritage Bluffs II Corm Translocation	1	0.02
Heritage Bluffs II Corm Translocation	0	0
Heritage Bluffs II Cut-Block Translocation	0	0
East Clusters Unit 3 Corm Translocation	18	0.2
Natural Population Sample (52 locations)	0	0

The percent of those thread-leaved brodiaea that expressed vegetatively and then flowered was extremely low during the spring of 2021. Factors that may have contributed to the low flowering rates were below normal rainfall seasonal totals, the distribution of the rainfall events (i.e., a wetter first part of the season and drier latter part), and warmer, drier conditions in late spring. Vegetative expression was good and it would appear that the corms were able to store energy for the next growing season. However, the thread-leaved brodiaea plants dried rapidly this year which was likely a limiting factor in flower production.



PHOTOGRAPH 1

View of Thread-leaved Brodiaea Location that was Disturbed by Herbivores
(Photo Date February 1, 2021)



PHOTOGRAPH 2

View of Thread-leaved Brodiaea Location that was Disturbed by Herbivores
(Photo Date February 1, 2021)



PHOTOGRAPH 3
View of Thread-leaved Brodiaea Location that was Grazed by Herbivores
(Photo Date March 4, 2021)



PHOTOGRAPH 4
View of Thread-leaved Brodiaea Location that was Grazed by Herbivores
(Photo Date March 5, 2021)



PHOTOGRAPH 5
Vegetative Growth at a Thread-leaved Brodiaea Translocation Plot
(Photo Date April 17, 2021)



PHOTOGRAPH 6
Vegetative Growth at a Thread-leaved Brodiaea Translocation Plot
(Photo Date March 4, 2021)



PHOTOGRAPH 7
Vegetative Growth at a Thread-leaved Brodiaea Translocation Plot
(Photo Date March 4, 2021)



PHOTOGRAPH 8
Vegetative Growth at a Natural Thread-leaved Brodiaea Location
(Photo Date March 4, 2021)



PHOTOGRAPH 9
Vegetative Growth at a Natural Thread-leaved Brodiaea Location
(Photo Date March 4, 2021)



PHOTOGRAPH 10
Vegetative Growth at a Natural Thread-leaved Brodiaea Location
(Photo Date March 4, 2021)



PHOTOGRAPH 11
Vegetative Growth at a Natural Thread-leaved Brodiaea Location
(Photo Date March 25, 2021)



PHOTOGRAPH 12
Vegetative Growth at a Thread-leaved Brodiaea Translocation Plot
(Photo Date March 4, 2021)



PHOTOGRAPH 13
Thread-leaved Brodiaea Flower (Photo Date May 12, 2021)



PHOTOGRAPH 14
Thread-leaved Brodiaea Flowers (Photo Date May 12, 2021)

6.0 Plant and Wildlife Observations

Native cover estimates were conducted visually. Native plant cover in the HBP is primarily comprised of native bunchgrasses along with scattered individuals of native perennial plants, for example, gumplant (*Grindelia camporum*), lemonadeberry (*Rhus integrifolia*), redberry (*Rhamnus crocea*), and California buckwheat (*Eriogonum fasciculatum*). The estimated native plant cover for the HBP is approximately 25 percent.

A list of plant species observed within the HBP, compiled during monitoring visits, is provided as Attachment 1. A total of 32 plants species were documented. Examples of native species observed in the preserve areas include blue-eyed grass (*Sisyrinchium bellum*) (Photograph 15), southern checkerbloom (*Sidalcea sparsifolia*) (Photograph 16), goldenstar (*Bloomeria crocea*) (Photograph 17), small-flowered morning glory (*Convolvulus simulans*) (Photograph 18), and death camas (*Toxicoscordion venenosum*) (Photograph 19). A few individuals of California sand-aster (*Corethrogyne filaginifolia*) (Photograph 20), long-stemmed golden-yarrow (*Eriophyllum confertiflorum*) (Photograph 21), and splendid mariposa lily (*Calochortus splendens*) (Photograph 22) were observed this year within the preserve.

A list of general wildlife species observed within the HBP was compiled during monitoring visits and is provided as Attachment 2. Observed wildlife included 4 species of insect, 1 snail species, 4 reptile species, 21 bird species, and 3 mammal species. Funnel spiders are common in the grassland habitat (Photograph 23). Other notable wildlife species observed on the site this past year were southern Pacific rattlesnake (*Crotalus oreganus helleri*; Photograph 24), greater roadrunner (*Geococcyx californianus*), and coyote (*Canis latrans*). The presence of the rattlesnake species and the coyote are beneficial as they may help to control the gophers. An owl box was installed in the large preserve area to attract barn owls (Photograph 25).

7.0 Native Grassland Mitigation

The Heritage Bluffs II project conditions of approval required the implementation of a native grassland mitigation element. A mitigation plan was approved that outlined the mitigation requirement that included the establishment of a minimum 0.15 acre of native grassland and the enhancement of a 0.30-acre buffer within a 0.45-acre restoration area. The restoration area is located on two old dirt roads that were included in the HBP (see Figure 3).

Implementation of the native grassland mitigation within the preserve began with the planting of the native bunch grasses during the first week of December 2020. Weed control was the primary maintenance activity conducted in the native grassland mitigation area during the 2021 monitoring year.



PHOTOGRAPH 15
Blue-eyed Grass Observed in the Heritage Preserve
(Photo Date April 19, 2021)



PHOTOGRAPH 16
Southern Checkerbloom Observed in the Heritage Preserve
(Photo Date May 12, 2021)



PHOTOGRAPH 17
Goldenstar Observed in the Heritage Preserve (Photo Date May 17, 2021)



PHOTOGRAPH 18
Small-flowered Morning Glory Observed in the Heritage Preserve
(Photo Date May 17, 2021)



PHOTOGRAPH 19
Death Camas Observed in the Heritage Preserve
(Photo Date February 2, 2021)



PHOTOGRAPH 20
California Sand-aster Observed in the Heritage Preserve
(Photo Date September 17, 2021)



PHOTOGRAPH 21
Long-stemmed Golden-yellow Observed in the Heritage Preserve
(Photo Date June 17, 2021)



PHOTOGRAPH 22
Splendid Mariposa Lily Observed in the Heritage Preserve
(Photo Date May 17, 2021)



PHOTOGRAPH 23
Funnel Spider Observed in the Heritage Preserved
(Photo Date April 19, 2021)



PHOTOGRAPH 24
Southern Pacific Rattlesnake Observed in the Heritage Preserve
(Photo Date May 22, 2021)



PHOTOGRAPH 25
View of Owl Nest Box Installed in the Heritage Preserve
(Photo Date October 28, 2021)

The success criteria for the native grassland mitigation include the assessment of species richness/recruitment, native vegetation cover, non-native vegetation cover, and target invasive species. The assessment of these criteria for Year 1 of the five year monitoring period as follows:

- **Species Richness and Recruitment:** Evaluation of the number of native species observed in the native grassland mitigation found three native plant species: purple needlegrass (*Stipa pulchra*), foothill needlegrass (*Stipa lepida*), and long-stemmed golden-yarrow. The presence of three native species meets the Year 1 success goal for this criteria which required three native species be present. No recruitment of any native species was observed this year.
- **Native Vegetation Cover:** Native vegetation cover was estimated to be 15 percent and was comprised primarily of the two native grass species planted. The Year 1 success goal for this criteria was 15 percent.
- **Non-native Vegetation Cover:** Cover of non-native vegetation was less than 1 percent due to the regular control of non-native species. The Year 1 success goal for this criteria was a maximum of 20 percent cover of non-native species.
- **Target Invasive Species:** There were no target invasive species (e.g., artichoke thistle [*Cynara cardunculus*], fennel [*Foeniculum vulgare*], Australian saltbush [*Atriplex semibaccata*], black mustard [*Brassica nigra*], bristly ox-tongue [*Helminthotheca echioides*], Russian thistle [*Salsola tragus*]) within the native grassland mitigation area due to regular control of these species during maintenance visits. The success goal for this criteria for Year 1 was no target invasive species present.

The native grassland mitigation area is progressing well at the end of the first year after installation. Regular control of non-native plant species and the introduction of native plant seed to the area will be conducted during the second year of monitoring.

8.0 Management Activities for 2022

Management activities to be conducted during 2022 will focus on the continued control of non-native grasses and perennial non-native plant species (e.g., artichoke thistle re-sprouts, fennel re-sprouts, Russian thistle, prickly lettuce [*Lactuca serriola*], and other weed species). Although significant progress was made in the control of perennial non-native plant species in 2022, control efforts will continue as re-sprouts and new seedlings of these noxious weeds begin to appear.

The maintenance of the native grassland mitigation area will concentrate on the control of invasive plant species during the second year. The temporary irrigation system will be maintained to provide supplemental water when needed. If weed control progresses well, other native plants may be added to the native grassland mitigation area this year to increase species richness.

ATTACHMENTS

ATTACHMENT 1

Plant Species Observed

Attachment 1
Plant Species Observed

Scientific Name	Common Name	Origin
ANGIOSPERMS: MONOCOTS		
ALLIACEAE	ONION FAMILY	
<i>Allium praecox</i>	early onion	N
APIACEAE (UMBELLIFERAE)	CARROT FAMILY	
<i>Foeniculum vulgare</i>	fennel	I
IRIDACEAE	IRIS FAMILY	
<i>Sisyrinchium bellum</i>	western blue-eyed grass	N
POACEAE (GRAMINEAE)	GRASS FAMILY	
<i>Avena barbata</i>	slender wild oat	I
<i>Brachypodium distachyon</i>	purple falsebrome	I
<i>Bromus diandrus</i>	ripgut grass	I
<i>Bromus hordeaceus</i>	soft chess	I
<i>Bromus rubens</i> [= <i>Bromus madritensis</i> ssp. <i>rubens</i>]	red brome	I
<i>Festuca perennis</i> [= <i>Lolium multiflorum</i> and <i>Lolium perenne</i>]	rye grass	I
<i>Stipa</i> [= <i>Nassella</i>] <i>lepida</i>	foothill needle grass	N
<i>Stipa</i> [= <i>Nassella</i>] <i>pulchra</i>	purple needle grass	N
THEMIDACEAE	BRODIAEA FAMILY	
<i>Bloomeria crocea</i>	common goldenstar	N
<i>Brodiaea filifolia</i>	thread-leaved brodiaea	N
<i>Dipterostemon capitatus</i> [= <i>Dichelostemma capitatum</i>]	blue dicks	N
ANGIOSPERMS: EUDICOTS		
AMARANTHACEAE	AMARANTH FAMILY	
<i>Amaranthus albus</i>	tumbleweed	I
ANACARDIACEAE	SUMAC OR CASHEW FAMILY	
<i>Rhus integrifolia</i>	lemonade berry	N
ASTERACEAE	SUNFLOWER FAMILY	
<i>Ambrosia psilostachya</i>	western ragweed	N
<i>Baccharis pilularis</i>	chaparral broom, coyote brush	N
<i>Corethrogyne filaginifolia</i> var. <i>filaginifolia</i>	California sand-aster	N
<i>Deinandra</i> [= <i>Hemizonia</i>] <i>fasciculata</i>	fascicled tarweed	N
<i>Encelia californica</i>	California encelia	N
<i>Eriophyllum confertiflorum</i> var. <i>confertiflorum</i>	long-stem golden-yarrow	N
<i>Grindelia camporum</i> [= <i>Grindelia camporum</i> var. <i>bracteosa</i>]	gumplant	N
<i>Lactuca serriola</i>	prickly lettuce	I
<i>Pseudognaphalium beneolens</i> [= <i>Gnaphalium canescens</i> ssp. <i>beneolens</i>]	fragrant everlasting	N
<i>Sonchus oleraceus</i>	common sow thistle	I
BRASSICACEAE (CRUCIFERAE)	MUSTARD FAMILY	
<i>Brassica nigra</i>	black mustard	I
CHENOPODIACEAE	GOOSEFOOT FAMILY	
<i>Atriplex semibaccata</i>	Australian saltbush	I
<i>Salsola tragus</i>	Russian thistle, tumbleweed	I

**Attachment 1
Plant Species Observed**

Scientific Name	Common Name	Origin
CONVOLVULACEAE	MORNING-GLORY FAMILY	
<i>Convolvulus arvensis</i>	bindweed, orchard morning-glory	I
<i>Convolvulus simulans</i>	small-flowered morning-glory	N
FABACEAE (LEGUMINOSAE)	LEGUME FAMILY	
<i>Medicago polymorpha</i>	California burclover	I
<i>Melilotus indicus</i>	sourclover	I
<i>Melilotus officinalis</i>	yellow sweetclover	I
GERANIACEAE	GERANIUM FAMILY	
<i>Erodium cicutarium</i>	redstem filaree	I
LAMIACEAE	MINT FAMILY	
<i>Stachys rigida</i> [= <i>Stachys ajugoides</i>] var. <i>rigida</i>	hedge nettle	N
MALVACEAE	MALLOW FAMILY	
<i>Sidalcea sparsifolia</i>	southern checkerbloom	N
MELANTHIACEAE	FALSE-HELLEBORE FAMILY	
<i>Toxicoscordion fremontii</i> [= <i>Zigadenus fremontii</i>]	Fremont's camas	N
POLYGONACEAE	BUCKWHEAT FAMILY	
<i>Eriogonum fasciculatum</i>	California buckwheat	N
<i>Rumex crispus</i>	curly dock	I
<i>Ranunculus californicus</i>	California buttercup	N
RHAMNACEAE	BUCKTHORN FAMILY	
<i>Rhamnus crocea</i>	spiny redberry	N
VIOLACEAE	VIOLET FAMILY	
<i>Viola pedunculata</i>	johnny-jump-up	N
ORIGIN		
N = Native to locality		
I = Introduced species from outside locality		

ATTACHMENT 2

Wildlife Species Observed

Attachment 2
Wildlife Species Observed

Scientific Name	Common Name
INVERTEBRATES	
APIDAE	HONEY BEES, BUMBLE BEES, AND ALLIES
<i>Apis mellifera</i>	European honey bee (I)
PIERIDAE	WHITES & SULPHURS
<i>Pontia protodice</i>	checkered [=common] white
NYMPHALIDAE	BRUSH-FOOTED BUTTERFLIES
<i>Junonia coenia grisea</i>	common buckeye
<i>Vanessa cardui</i>	painter lady
HELMINTHOGLYPTIDAE	LAND SNAILS
<i>Helminthoglypta traskii coelata</i>	Peninsular Range shoulderbrand snail
PHRYNOSOMATIDAE	SPINY LIZARDS
<i>Sceloporus occidentalis longipes</i>	Great Basin fence lizard
<i>Uta stansburiana elegans</i>	western side-blotched lizard
COLUBRIDAE	COLUBRID SNAKES
<i>Pituophis catenifer annectens</i>	San Diego gophersnake
CROTALIDAE	RATTLESNAKES
<i>Crotalus oreganus helleri</i>	southern Pacific rattlesnake
BIRDS	
ODONTOPHORIDAE	NEW WORLD QUAIL
<i>Callipepla californica</i>	California quail
ACCIPITRIDAE	HAWKS, KITES, & EAGLES
<i>Accipiter cooperii</i>	Cooper's hawk
<i>Buteo jamaicensis</i>	red-tailed hawk
<i>Circus hudsonius</i>	northern harrier
CHARADRIIDAE	LAPWINGS & PLOVERS
<i>Charadrius vociferus</i>	killdeer
FALCONIDAE	FALCONS & CARACARAS
<i>Falco sparverius</i>	American kestrel
COLUMBIDAE	PIGEONS & DOVES
<i>Zenaidura macroura</i>	mourning dove
CUCULIDAE	CUCKOOS & ROADRUNNERS
<i>Geococcyx californianus</i>	greater roadrunner
TYRANNIDAE	TYRANT FLYCATCHERS
<i>Sayornis nigricans</i>	black phoebe
<i>Sayornis saya</i>	Say's phoebe
<i>Tyrannus verticalis</i>	western kingbird
CORVIDAE	CROWS, JAYS, & MAGPIES
<i>Corvus brachyrhynchos</i>	American crow

**Attachment 2
Wildlife Species Observed**

Scientific Name	Common Name
ALAUDIDAE	LARKS
<i>Eremophila alpestris actia</i>	California horned lark
AEGITHALIDAE	BUSHTIT
<i>Psaltriparus minimus</i>	bushtit
POLIOPTILIDAE	GNATCATCHERS
<i>Polioptila californica californica</i>	coastal California gnatcatcher
TURDIDAE	THRUSHES
<i>Sialia mexicana</i>	western bluebird
MIMIDAE	MOCKINGBIRDS & THRASHERS
<i>Mimus polyglottos</i>	northern mockingbird
PARULIDAE	WOOD WARBLERS
<i>Setophaga [=Dendroica] coronata</i>	yellow-rumped warbler
PASSERELLIDAE	NEW WORLD PASSERINES
<i>Melospiza [=Pipilo] crissalis</i>	California towhee
ICTERIDAE	BLACKBIRDS & NEW WORLD ORIOLES
<i>Sturnella neglecta</i>	western meadowlark
FRINGILLIDAE	FINCHES
<i>Haemorhous [=Carpodacus] mexicanus</i>	house finch
MAMMALS	
LEPORIDAE	RABBITS & HARES
<i>Sylvilagus bachmani</i>	brush rabbit
GEOMYIDAE	POCKET GOPHERS
<i>Thomomys bottae</i>	Botta's pocket gopher
CANIDAE	CANIDS
<i>Canis latrans</i>	coyote
(l) = introduced species	